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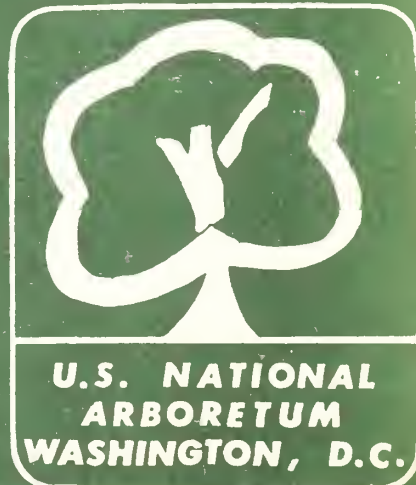
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U.S. NATIONAL ARBORETUM

ANNUAL REPORT

1974-75

AGRICULTURAL RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE



U.S. NATIONAL
ARBORETUM
WASHINGTON, D.C.

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U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
U.S. NATIONAL ARBORETUM

ADMINISTRATION

John L. Creech, Ph.D., Director
M. W. Scarborough, Manager
Doris M. Thibodo, Secretary
Henry T. Skinner, Ph.D., Collaborator

PLANT COLLECTIONS AND PLANT EXCHANGE

Sylvester G. March, Horticulturist
Judith L. Shirley, M.S., Plant Propagator
Robert F. Drechsler, B.S., Curator, Bonsai Collection
Thurman J. Dade, Greenhouse and Gardens

EDUCATION, INFORMATION AND LIBRARY

Erik A. Neumann, M.S., Horticulturist, Curator of Education
Mary Ann Jarvis, Educational Assistant
Jayne MacLean, M.S., Librarian

ARBORETUM RESEARCH

Nomenclature and Taxonomy of Cultivated Plants

Frederick G. Meyer, Ph.D., Curator, Arboretum Herbarium
Theodore R. Dudley, Ph.D., Taxonomist, Curator of Type Collections
Roland M. Jefferson, B.S., Botanist
Peter M. Mazzeo, B.S., Herbarium Assistant

Cytogenetics, Breeding and Evaluation of Shade Trees

Frank S. Santamour, Jr., Ph.D., Research Geneticist
Robert L. Pryor, B.S., Horticulturist
Gene K. Eisenbeiss, B.S., Horticulturist
Harold E. Vettel, B.S., Chemist

Cytogenetics, Breeding and Evaluation of Ornamental Shrubs

Donald R. Egolf, Ph.D., Research Geneticist
Anne O. Andrick, Research Technician

Ornamental Introduction, Evaluation and Development

William L. Ackerman, Ph.D., Research Horticulturist

Plant Introduction Station, Glenn Dale, Maryland

Howard E. Waterworth, Ph.D., Virologist

COOPERATIVE SERVICES

National Capital Area Federation of Garden Clubs, Inc.

President, Mrs. John J. Mooseberger
Information and Activity Center, Mrs. Charles Vandover
Volunteer Guide Service, Mrs. Judson B. French

Friends of the National Arboretum

Trustees: Frank P. Cullinan, Ph.D.
Mrs. B. A. Powell

NATIONAL ARBORETUM ADVISORY COUNCIL
July 1974 - July 1976

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Princeton, New Jersey

Dr. John P. Mahlstedt, Vice Chairman
Ames, Iowa

Dr. H. O. Graumann, Executive Secretary
U.S. Department of Agriculture

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Mr. Alfred S. Martin
Philadelphia, Pennsylvania

Mr. John B. Wight, Jr.
Cairo, Georgia

REPORT OF THE U.S. NATIONAL ARBORETUM
For the Period May 1, 1974 - August 31, 1975

Prepared for the Meeting of the
Advisory Council
October 30-31, 1975

ARBORETUM ADMINISTRATION

A. Operational Costs

The FY 1975 Operating Plan Budget was \$1,032,574. This included \$914,371 for Personal Services and \$118,203 for Support Services. During the year, the initial budget was increased by \$199,900 to pay for increased fuel and energy costs, major repairs, mandatory salary increases, bringing the bonsai collection from Japan, and architectural fees to design a viewing pavilion for the bonsai collection. The true expenditures at the end of June 1975 were \$1,231,194.

The FY 1976 Operating Plan Budget is \$1,171,000. The Regional Deputy Administrator, Dr. Steven C. King, has increased this by \$26,500 to account for extra personal services in conjunction with the Bicentennial year and for much-needed replacements for mowing equipment. In addition, Dr. King has set aside funds for the constructing of the first phase of the viewing pavilion for the bonsai collection. Construction is expected to begin during the current winter season.

As with prior years, salary costs far outstrip the funds available for other operations. Increases were mainly caused by an over-all review of National Arboretum employee structure which resulted in the upgrading of a number of GS and WG employees. Despite the increasingly difficult financial status in which the Arboretum finds itself each year, the Agricultural Research Service has seen fit to maintain Arboretum support at a sustained level when other ARS units were receiving reductions in funds. The Regional Deputy has utilized reserve funds on several occasions when our needs were beyond our financial capabilities.

B. Friends of the National Arboretum

This is a year for change in the Friends of the National Arboretum. The Office of the General Counsel of the Department examined the Memorandum of Understanding under which we have been operating since 1956 and ruled that it is inadequate as authority for the Secretary of Agriculture to receive gifts on behalf of the Arboretum. As a consequence, legislation was introduced into Congress by the Department to correct this deficiency. Each member of the Advisory Council received copies of the Senate and House Bills. The Senate has passed their Bill, and the House is in process of deliberation. There is every reason to believe that when this Amendment to the Act establishing the Arboretum is signed, the National Arboretum will have far broader capability to acquire gifts for the enhancement of the Arboretum's program.

Donations to the Friends of the Arboretum since April 1974 have totaled \$42,707.04. Bank savings for the period amounted to \$237.78. The purchase of plants, educational materials, improvements to sponsored gardens, etc. amounted to \$21,920.38. The first phase of renovation to Cryptomeria Valley, below the Garden Club of America area, totaled \$10,685.26.

Among the major monetary contributions to the Friends of the National Arboretum were gifts from a single donor of \$14,528.91 in 1974 and \$11,024.35 in 1975, designated for the development of Cryptomeria Valley. The Woman's National Farm and Garden Association donated \$2,350 for the eventual construction of a strolling walk and viewing patio for elderly and handicapped visitors to the Arboretum. Miscellaneous contributions for a flowering shrub garden amounting to \$6,262.30 have been made in memory of the late Mr. Jacques Legendre, a nurseryman reknown for his plant introductions. Members of the Camellia Society of the Potomac Valley have contributed \$505.00 to the fund for use in updating the Camellia collection. Several new items have been added to the collection under Dr. Ackerman's guidance. The Society is making this a permanent part of their program, and the Arboretum's Camellia collection should benefit greatly from the additional help.

C. Business Operations

Equipment. New equipment includes an 84" Woods mower, a heavy equipment mover to permit transporting tractors and equipment to Beltsville and Glenn Dale. Replacements included a Woods 80" mower and an 82" Howard riding mower. From government surplus, we obtained a No. 12 Caterpillar Grader, TD-6 Bulldozer, and a 120-volt portable generator. We were fortunate to be able to upgrade six trucks by transfer from Beltsville and replace one other truck with a sedan-delivery.

Personnel. The authorized personnel strength for the Arboretum is 75 employees. Dr. William Ackerman transferred to the Arboretum from Glenn Dale, Maryland, to concentrate on research. By transfer, the Arboretum gained a chemist, Mr. H. Vettel, who will assist Dr. Santamour in his plant breeding laboratory. Mr. Robert F. Drechsler has been appointed Curator of the recently acquired Bonsai Collection. Mr. Drechsler has a B.S. Degree in Horticulture from the University of Maryland. He has been employed at the Arboretum since 1959 with the shrub breeding project. We have two replacement guards and two clerk-typists. During the summer, a total of seven students were employed, temporarily, to excellent advantage.

Training. One employee (Mr. Bobby Anderson) was selected through the USDA Upward Mobility Program to undertake a college level academic study. Twenty-eight employees took formal training ranging from seminars to college level courses aimed at improving work skills.

D. Safety, Facilities, Future Expansion

Safety. We have corrected the shop wiring. This included grounding the electrical wiring in all outlets, replacement of faulty wiring, and new receptacles. The welding machines were relocated and rewired and all new overhead lighting was installed. Signs were put in all hazardous areas; bridges were rebuilt and/or repaired in the azalea area. A public first-aid room has been set up and has been put to use on several occasions. Maps locating all fire extinguishers have been prepared and made available to appropriate agencies. A comprehensive self-protection plan for the National Arboretum and Glenn Dale Plant Introduction Station has been prepared by Mr. Scarborough and distributed to supervisory staff and regional administrators. Mr. Eisenbeiss replaces Dr. Egolf as Chairman of the Safety Committee.

Facilities. Among the major facilities improvements were the emplacement of cement block walls around the three new plastic plant houses and complete replacement of the herbarium roof. This latter job completes the entire re-roofing of the Administration building. We still need to undertake roof repairs to the headhouse and replacement of heating pipes in the propagating house. Two additional plastic houses are in storage for eventual erection as replacements for three smaller and much antiquated houses. Approval has been given to raze the old greenhouse range when funds become available. This group of buildings near the "M" Street entrance is both an eyesore and a safety hazard.

Projected Expansion

Brickyard Acquisition. Despite complications, the Department continues to press for the acquisition of the 32-acre brickyard located between the Arboretum and New York Avenue. The earlier plan to conduct a land exchange has been abandoned, and the Department is preparing a request for an amendment to the FY 1976 appropriation for direct purchase of the property. All indications are that the prospects of an Inner Loop access to the "M" Street entrance are not good in the foreseeable future. This leaves the Arboretum without a major entrance unless we succeed with the brickyard purchase.

Bonsai Viewing Pavilion. The Arboretum has received a major collection of bonsai from the Nippon Bonsai Association as a Bicentennial gift from the Japanese people. Plans are being developed for an appropriate pavilion in which to grow and display this magnificent collection. The courtyard will be off the east patio of the Administration building. When accomplished, the complex will include an entrance-assembly area in Japanese style, a display garden and growing area in a walled courtyard, a formal tea house for viewing related bonsai specimens, and a work-classroom facility. The garden and growing courtyard is scheduled for completion in July 1976, at which time the collection will be dedicated. The second phase will be construction of the tea house-work facility and assembly area. Eventually, a courtyard will be added to include precious American-grown bonsai. The present collection is considered

to be the finest bonsai assembled anywhere outside Japan. Currently, the collection is housed in the plant quarantine facilities at the Plant Introduction Station, Glenn Dale, Maryland.

Expanding Herbarium Facilities. The Arboretum herbarium has received a transfer of 91 herbarium cases from the Smithsonian Institution. In the 1974 report, we accounted for 377,900 specimens and these had filled every case on hand. This year, the Smithsonian was able to purchase a number of new cases and disposed of old ones to less-fortunate institutions. By acquiring these 91 herbarium cases, the Arboretum saved an estimated expense of \$30,000. These cases will permit increases to the collection for at least 5 years. However, all space in the herbarium is now utilized and it is necessary to consider what kind of expansion to the herbarium is necessary by 1980.

National Herb Garden. The Herb Society of America is cooperating in the planning for a major garden of herbs at the National Arboretum. This will include all facets of the use of herbs in medicine, perfumery, cooking, and other use aspects of herbs. An area of experimentally used plants such as promising anti-cancer plants and industrial new crops will be considered. The Herb Society proposes to provide the funds for construction of the garden, and the Arboretum will maintain and develop the garden. The activation of this project is being delayed until the Bill amending the original Act in relation to the acceptance of gifts has been acted upon by Congress.

Cryptomeria Valley. We are in process of reclaiming the swale below the Garden Club of America. This lovely view down to the Anacostia gradually has retreated to weeds and gulleys. Through the Friends, we have cleared the swale, reconstructed the grade, and are beginning to establish species native to Asia. The future plans will include access paths, a waterway to prevent erosion, and plantings of the more tender Asiatic plants in this rather unique micro-climatic niche. The general plan was developed by the joint efforts of the Arboretum staff and Mr. H. Sasaki.

Information and Activity Center. The National Capital Area Federation of Garden Clubs has generously taken care of the Center, including the widely used activities room in the basement. There still needs to be a complete landscaping of the surrounding grounds, expansion of the rear patio, and other amenities for outside meetings.

Plants in the Landscape. An area has been set aside for developing a display of the best shrubs for residential, highway, and other uses. In this area, plants will be grouped on a character basis, such as texture, habit, seasonal color, and combining quality. A preliminary landscape plan has been drawn. The next step is to prepare a plant list and assemble plant materials.

Strolling and Rest Area. Many visitors to the Arboretum are not capable of managing our slopes and walks. Yet they enjoy being among the plants. In Japan, gardens are designed for quiet contemplation. We plan

a strolling area above the Magnolia collection where there is an excellent vista down the Anacostia River. This site will feature some of our old-fashioned shrubs and a circular patio with ample bench space on the patio and along the path.

PLANTS, PLANTINGS, AND SERVICES

A. Plant Records, Mapping and Labeling

Since May 1, 1974 through June 30, 1975, the following has been accomplished:

- A total of 1,510 acquisitions of plants, seeds, scions, and cuttings were accessioned.
- Approximately 1,267 new record and display labels were added to, or replaced, in various plant collections throughout the Arboretum.
- Plant location maps were updated for the Administration Building, the greenhouse area, the Hibiscus planting, and the Boxwood-Daylily planting.
- Because of vandalism on the Touch and See Nature Trail, cut ropes had to be replaced and several reading stations repaired.

B. Plant Collections

Significant progress has been made in the following areas:

--Gotelli Collection - Two hundred eighty-seven conifer species, varieties and cultivars have been identified and authenticated. Each plant is documented with accurate, up-to-date records in the accession catalog, with locations noted on up-dated maps. Six hundred forty-eight herbarium voucher specimens, with photographs and complete habit and botanical descriptions, have been placed in the herbarium. This encompasses approximately 18% of the collection. The 430 conifer accessions donated or purchased during recent years have been placed in the collection. The remainder of the plants are to be used elsewhere on the Arboretum. Thirty-nine illustrated display labels have been designed and prepared for placement in the collection. Seventy-eight requests for 322 accessions were filled during the past year.

--Fern Valley and Daffodil-Ivy Collections - Hans Grullemans of J. J. Grullemans & Son, Holland, donated a collection of new and improved daffodil varieties in memory of Jacques Legendre. When Mr. Grullemans visited the Arboretum recently, plans were discussed for a species collection of daffodils. The ivy collection has been expanded by the addition of newly acquired cultivars. We are continually working toward clarification of the taxonomic standing of many of the specimens in our collection. The American Ivy Society and various private individuals throughout the country have been helpful. For example, Ms. Karlene M. Gayl, University of Pennsylvania, is researching the pollen parent of x Fatshedera lizei.

It is believed that this hybrid is the result of an accidental cross between Fatsia japonica and Hedera helix var. hibernica. The Arboretum supplied Ms. Gayl with cuttings of H. helix var. hibernica, x Fatshedera lizei, Fatsia japonica, and several cultivars of Hedera. Several rare or endangered species (Elliottia racemosa, Croton alabamensis, Franklinia alatamaha) have been added to Fern Valley. The encroachment of man upon his environment has caused us to accelerate our efforts to collect desirable plants before they are destroyed. By this means, we have been able to preserve valuable material and add to our collections. Work has been completed on several information signs that will appear throughout Fern Valley and the Ivy-Daffodil plantings. These include discussion of the concept of an ecosystem; the history, cultivation and classification of daffodils; the story of x Fatshedera lizei; and a brief history and culture of the ivies.

--Camellia Collection - Major changes have been made in the Camellia Collection during the past year. Through donations, over 100 accessions of Camellia japonica, C. vernalis, and various hybrids have been added. Members of the Camellia Society of the Potomac Valley grafted about 100 accessions, using old plants in the collection as understocks, and helped with the pruning. Several of the paths were reconstructed with gravel on a concrete base, and all of the dry stone walls were rebuilt. New information signs are being made for the various collections and unusual plants in the garden. These identify the witchhazels and their relatives, liriope, ophiopogons, cryptomerias, and jujubes. Many new plants have been added to the Garden Club of America planting through the generosity of the Members at Large, GCA. These include an extensive planting of Pieris japonica cultivars and several species of Corylopsis and Stewartia. One hundred Rhododendron metternichii var. yakushimanum seedlings were also planted. A major renovation in the Garden Club of America has been started through the Friends of the Arboretum. A plan for developing the valley between the Gazebo trail and the Camellia planting was prepared by Mr. H. Sasaki. This calls for a rock stream bed with small cascades running down the center of the ravine and paths down either side terminating at a pond at the lower level. The area naturally divides into three distinct planting sites. Because of its protected location, this microclimate will enable us to use plant material not ordinarily grown in the Washington area. Emphasis will be on tender plants of Asian origin such as Trachycarpus fortunei, Taiwania cryptomerioides, Pittosporum tobira, Daphniphyllum macropodum, Sarcandra glabra, and others.

--Azalea-Rhododendron Collection - This area has felt the impact of the reduction in the labor force. Of necessity, the major thrust has been on maintaining the present collection rather than any extensive new development. Efforts are still underway to complete the set of Glenn Dale azaleas. Thirty-three of the missing cultivars were added from five sources during the past year. Only seven cultivars are still needed to complete the collection as described



by B. Y. Morrison. All new Glenn Dale acquisitions are checked for proper identification before being placed in the permanent collection. The most significant new planting is a set of Robin Hill azaleas, a late-flowering group developed by Robert D. Gartrell of Wyckoff, New Jersey. These late-flowering cultivars were selected from Satsuki, Glenn Dale, and Gable hybrids and, to a lesser extent, Kaempferi and Belgian hybrids. We are currently evaluating their performance for the Washington area. A much-needed inventory of 700 cultivars in the Azalea Loop has been completed. Special information signs are being prepared for the major plantings and for unusual specimen plants such as Pistacia chinensis x P. integerrima.

--Bonsai Collection - The precious Bonsai and the two exhausted couriers, Dr. Creech and Mr. March, arrived at the U.S. Plant Introduction Station, Glenn Dale, Maryland, on April 1, 1975, after flying cargo jet from Tokyo to San Francisco and then on to Baltimore. It required 16 truck-loads to transport the 54 cases, ranging in size from 2' x 2' x 2' to 7' x 6' x 6', from Baltimore-Washington International Airport to Glenn Dale. On hand at Glenn Dale to assist in the unpacking, placement, and documentation when the plants arrived, were Mr. Drechsler, Plant Quarantine Inspector, Glenn Dale and National Arboretum staff members, and representatives of the Office of Information. Assisting Mr. Drechsler in the care of the plants are Mr. Monroe, Biological Technician, and Mrs. Dorothy Warren and Mrs. Ruth Lamanna, volunteers trained and experienced in bonsai. Dr. Floyd Smith, Entomologist, is helping resolve insect and disease problems. We have also benefited from two visits by members of the Board of Directors, Nippon Bonsai Association, on May 3-6 and July 6-7. They plan a third visit in October. Interest in the collection is running high and, although the collection is not on public view, there has been a steady stream of dignitaries to Glenn Dale. These have included Members of Congress; officials from the Department of Agriculture, Japanese Embassy, and State Department; various bonsai organizations and well-known bonsai specialists. Of particular note are visits by the Secretary of Agriculture and Mrs. Butz; Mrs. Yasukawa, wife of the Japanese Ambassador; and Mrs. Abe, wife of the Japanese Minister of Agriculture. There has been considerable publicity concerning the collection in spite of our desire to save the main thrust of publicity for the official dedication ceremony on July 9, 1976. In preparation for the dedication, the Director has appointed a committee consisting of representatives from the Arboretum; ARS Information Office; National Capital Area Federation of Garden Clubs; and the Potomac Bonsai Society, local host for the Bonsai Clubs International Convention to be held at the time of the Dedication.

--Miscellaneous - Significant additions to permanent plantings not mentioned above include: 21 herbaceous peonies; 19 cultivars of Adonis amurensis; 5 flowering cherries; 7 Hamamelis; 5 Cotinus

coggygia; 5 species of Corylopsis; 4 Cornus cultivars; and plants of Nyssa ogeche, Pieris phillyreaefolius, Osmunda x ruggii, Musa basjoo, and Edgeworthia chrysantha.

Plant and Seed Solicitation by Individual Requests from Arboreta, Botanic Gardens, and Cooperators

	<u>Requests</u>	<u>Packets of Seed or Number of Plants</u>
Cuttings, Scions, Divisions	65	2761
Seed	41	767
Plants	88	464

Special Requests for Plant Material (selected examples)

- Seed of Oxydendrum arboreum (Ericaceae) to Mr. K. Wade, Hakoneya Nursery, Japan, for testing as Rhododendron understock.
- Cuttings of 20 conifers (7 genera) and 31 hollies (Ilex opaca and I. aquifolium cultivars) to Dr. Tatsuo Aritaki, Aritaki Arboretum, Japan, to augment the initial development of permanent conifer and holly collections.
- Cuttings and ovulate cones of a variety of conifers to Dr. Charles N. Miller, University of Montana, for use in a study of the evolution of conifers.
- Seed of Hovenia dulcis to Dr. D. K. Ourecky, New York State Agricultural Experiment Station, for inclusion in a collection of minor fruit plants for trial in New York.
- Seed of native perennial wildflowers to Mr. Paul McCabe, Huntsville, Alabama, for Alabama roadside planting project.
- Seed of Persea borbonia to Mr. Albert Emery, Highlands, New Jersey, for selection of possible hardy seedlings and introduction into nursery trade.
- Seed of Commelina communis to John P. Rogers, University of Rhodesia, for a study to monitor various cotton cultivars for abscisic acid-like substances.
- Seed of Acer nikoense to Mr. Greg Vergara, USDA Shade Tree and Ornamentals Plants Laboratory, Delaware, Ohio, for a research project concerning meristematic culturing techniques of trifoliate maples and the effects of gibberillic acid upon growth rate to reduce seed to flowering-time period.
- Plants of American native Franklinia alatamaha and of American selection Metasequoia glyptostroboides 'National' contributed by Dr. J. L. Creech to botanic gardens in the People's Republic of China upon his visit last fall.
- Cuttings of 10 Camellia sasanqua cultivars to The Morris Arboretum for evaluation of their hardiness and inclusion in permanent collection.
- Seed and scions of heavy fruiting trees of Quercus acutissima and Diospyros virginiana to P. F. Brown, Oak Ridge, Tennessee, for study of a succession of rough pasture and tree crops to feed pigs to market weight hogs in the late fall and winter period in Appalachian hill country.
- Rooted cuttings from type plants of Rhododendron bakeri 'Camp's

- Red' and R. prunifolium 'Hohman' to P. H. Brydon, Rhododendron Species Foundation, Salem, Oregon.
- Seed and vouchers of native woody plants to Mr. Peter A. Thompson, Royal Botanic Gardens Kew, for inclusion in woody plant seed bank project.
 - Divisions of 13 Hemerocallis species to Mr. J. D. Seeden, Bloomington, Minnesota, for breeding project.
 - Seed of native woody plants by special request to Dr. A. G. Golovasz, Botanical Institute, Leningrad, and Dr. P. I. Lapin, Main Botanical Garden, Moscow, USSR.
 - Divisions of Liriope and Ophiopogon species to Mr. Fritz Kummert, Verwaltung der Bundesgarten, Schonbrunn, Austria, for inclusion in Liriope collection.

Plant Acquisitions (Donations)

Collection of 18 Hedera helix cultivars from W. O. Freeland, Columbia, South Carolina; 12 dwarf conifer cultivars from Watnong Nursery, Morris Plains, New Jersey; cuttings of 14 Robin Hill azalea cultivars from R. D. Gartrell, Wyckoff, New Jersey; cuttings of 11 Back Acre azalea cultivars from Norman L. Kennedy, Charlotte, North Carolina; 14 dwarf conifer cultivars from Edward Rezek, Malverne, New York; a plant of the rare fern hybrid, Osmunda x ruggii, from Warren H. Wagner, University of Michigan; 27 Hemerocallis cultivars from George I. Crossman, Hamilton, Virginia; cuttings of 5 Camellia japonica cultivars from Frank Teuton, Oxon Hill, Maryland; a collection of 41 Satsuki azalea cultivars from Thomas Wheelton, Richmond, Virginia; 20 Narcissus cultivars from Hans Grullemans, Lisse, Holland; a collection of 11 Glenn Dale and Satsuki azalea cuttings from George W. Harding, Germantown, Maryland; plants and cuttings of 6 ornamentals collected by John L. Creech, National Arboretum, at the Botanical Garden, Canton, People's Republic of China; seed of 20 woody ornamentals from the Chinese Academy of Agriculture and Forestry Sciences, PRC; 19 Adonis amurensis cultivars from Takashi Nakamura, Saitamaken, Japan; cuttings of 24 Cryptomeria japonica cultivars from the Aritaki Arboretum, Saitama-Ken, Japan; cuttings of 12 Juniperus species from the Morton Arboretum, Lisle, Illinois; 5 Malus cultivars from Simpson Orchard, Vincennes, Indiana; seed of Pritchardia remota, an endangered species, from Waimea Arboretum, Haleiwa, Hawaii; plants of 18 Camellia japonica and C. reticulata cultivars from Mrs. Frances Fitzhigh, McLean, Virginia; a collection of 11 Aucuba japonica cultivars through the Woman's National Farm and Garden Association; a collection of 11 Hamamelis cultivars through the Rare Plant Group, Garden Club of America, from Hillier and Sons, Winchester, England; plants of 11 Magnolia species and cultivars and 16 choice trees and shrubs including Corylopsis, Pieris, and witchhazel relatives through the Members at Large, Garden Club of America, from Kingsville Nursery, Kingsville, Maryland; 180 plants of Ilex crenata 'Helleri' from Tom Dodd Nurseries, Semmes, Alabama, to line a walkway; plants of 78 Camellia japonica cultivars and hybrids

through the Camellia Society of the Potomac Valley, from Laurel Lake Gardens and Nursery, Salemburg, North Carolina; 9 Hemerocallis species, varieties, and cultivars collected in Japan and Korea by Dr. Shu-ying Hu of The Arnold Arboretum, Jamaica Plain, Massachusetts; plants and cuttings of 7 not-readily-available Glenn Dale azaleas from M. D. Rees, Hyattsville, Maryland; and cuttings of 4 not-readily-available Glenn Dale azaleas from Neal P. Campbell, Washington, D.C.

Plant and Seed Distribution Programs, 1974-75

The General Plant Distribution Programs at the National Arboretum are annual distributions of select ornamental plant materials to domestic and foreign, commercial and non-commercial organizations, as described below:

--Domestic Plant Distribution - This domestic distribution, begun in 1960, has been designed to make plant materials available to fellow non-commercial institutions, such as arboreta, botanic gardens, universities, and plant introduction stations, within the United States. Plant materials are selected on the basis of their horticultural and botanical interest and their availability (or non-availability) in this country. This plant distribution program takes full advantage of the unique opportunities available to the Arboretum and its staff to recognize and collect unusual and valuable plant materials. These materials may include newly named cultivars; species collected from spontaneous well-documented sources throughout the world; rare or endangered species from spontaneous or cultivated sources. The 1975 Domestic Plant Distribution was a combined effort incorporating those plant materials formerly included in the annual Glenn Dale Ornamental Plant Distribution. In the future, there will be one Domestic Plant Distribution using the combined plant materials, facilities, and expertise of both organizations. The resulting 1975 distribution, sent to 176 cooperating institutions, featured a descriptive pamphlet listing 44 available items.

No. Participating:	176
No. Requests:	138
No. Plants Sent:	2833

--Commercial Plant Distribution - This program is the successor to the long established Glenn Dale Distribution program. It is designed to make available to domestic propagating nurserymen those plants of horticultural merit and commercial potentiality which have not previously been generally available in the nursery trade. The participating nurseries were selected on a climatic and geographic basis as well as the nurseryman's ability and willingness to perpetuate and propagate these plants for the trade. It is hoped that this type of distribution will contribute to a greater variety of plants in the nursery trade and consequently enhance public interest in horticulture. The 1975 Commercial Plant Distribution featured detailed descriptions of 5 available items.



No. Participating:	46
No. Requests:	23
No. Plants Sent:	364

Special Plant Distribution Programs occur intermittently, include a variety of plant types, and may involve both foreign and domestic cooperators.

--Distribution of National Arboretum Introductions - New cultivars developed through the shrub and tree breeding programs, once fully tested, evaluated, named, and released, are distributed to our domestic non-commercial institutions (176) as well as to foreign arboreta and botanic gardens (70), depending upon the hardiness and general adaptability of the plant material. National Arboretum introductions are distributed singly or as a unit, apart from other distributions, to accentuate their uniqueness and desirable characteristics. There was no distribution of Arboretum introductions this current year.

--Distribution of Native American Plants - Three botanically unique, native American plants were made available for distribution to 70 foreign botanic gardens, arboreta and other institutions conducting educational or research programs with woody plants. Such a list would typically include plants of particular botanical or horticultural interest, rare or endangered species. The 1975 special distribution was composed of Alnus maritima, Franklinia alatamaha, and Salix humilis var. microphylla.

No. Participating:	70
No. Requests:	31
No. Plants Sent:	152

--National Arboretum Seed List - The Seed List is sent annually to approximately 240 foreign arboreta and botanic gardens. Its purpose is to provide seed of native American plants to interested foreign institutions, thereby encouraging a wider dissemination of germ-plasm resources. In 1974-75, the participation of these institutions was re-assessed and a realignment was made to give a more even and thorough geographic distribution of the Arboretum's Seed List as well as to encourage the exchange of seed list publications with these similar institutions. The 1975 National Arboretum Seed List is composed entirely of seed, documented as to locality, of native North American plants. A voucher herbarium specimen is made for each entry on the list.

No. Participating:	240
No. Requests:	112
No. Seed Packets Sent:	1801



EDUCATION, PUBLIC SERVICES AND LIBRARY

A. Education and Information

Response to Public Queries. The Education Office answered 4900 questions about plant problems and horticultural events; 3350 by telephone, 1150 by letter, and 400 through personal contact at the Information and Activity Center.

Volunteer Guide Service. Thirty-nine volunteers conducted 110 tours during the past year. An intensive training course for volunteers has been held throughout the spring and summer months to acquaint the volunteer guides with plant collections and on-going programs at the Arboretum. The professional staff and plant society specialists participated in the training sessions. School groups and garden clubs accounted for nearly one-half of these tours, with the balance consisting of senior citizens, junior garden clubs, county extension tours, diplomatic wives, garden editors, college groups, and miscellaneous professional and governmental groups.

Botanical Art Displays. Throughout the year, monthly displays of a botanical or horticultural nature representing a variety of media and subject matter have been exhibited in the lobby of the Administration Building and at the Information and Activity Center. Exhibits in 1974-75 have included 20 subject matters.

At the request of botanical artist Jeanne Holgate, the Franklin Mint has presented the Arboretum with prints of 18 pictures done by Ms. Holgate for the Mint depicting the 50 official state flowers. It is planned that these prints will become the main exhibit in the lobby during the Bicentennial summer.

Arboretum Exhibits. Staff members have provided the following special exhibits for display at various functions:

- Educational Programs at the U.S. National Arboretum - District Meeting, National Capital Area Federation of Garden Clubs, Inc.
- Exhibit of Books and Literature on Lilies - Annual Show, Potomac Lily Society.
- The Dawn Redwood (*Metasequoia glyptostroboides*) - Meeting of the International Shade Tree Conference, Baltimore, Maryland.
- Educational Programs at the U.S. National Arboretum - 1974 Metropolitan Horticultural Happening, Landover Mall, Landover, Maryland.
- Arboretum staff members provided several educational exhibits for the national meeting of the Garden Club of America's Convention at the Shoreham Americana, Washington, D.C. Exhibits provided for this occasion included one on the herbarium at the Arboretum, displays of rare and endangered species of plant material, and an exhibit of new cultivars from the National Arboretum.

Popular Publications. The following Arboretum Program Aids (PA) and USDA Home and Garden Bulletins (HG) were written or revised by Arboretum staff members: HG #142, Selecting Shrubs for Shady Areas; HG #86, Growing

Camellias; HG #135, Growing Crabapples. A Program Aid on the Gotelli Collection of Dwarf and Slow-Growing Conifers is in the final art stage and publication is expected by spring of 1976. A text has been submitted for an Agriculture Information Poster featuring the National Arboretum. This publication will supersede the publication on the Arboretum which was produced at the time of the Administration Building dedication. Photographs for the poster have been taken by Department photographers. It is expected that this publication will also be available for the 1976 spring season. A prospectus has been submitted for the Program Aid on the Arboretum's Bonsai Collection which should be available for the dedication of the collection in July 1976. Thirty-five Correspondence Aids were prepared or revised for public distribution.

Radio-TV and Talks. The Curator of Education taped 10 programs for national radio and television and presented 31 talks to groups ranging from garden clubs, high school and college classes, to educational specialists and press groups.

Special Projects. The Curator of Education was again involved in Widening Horizons classroom and field demonstrations. Thirty-five students participated in each of five programs. Widening Horizons is a District of Columbia project to acquaint under-privileged youth with government activities and opportunities. Within each participating Federal agency, the program is hosted by wives of cabinet-level officials.

Teacher/leader workshops were given to introduce the Arboretum as a local educational resource to District of Columbia Public School Teachers and administrators for the Career Development Exemplary Project of the District of Columbia Public Schools' Curriculum Development Program of which the Curator of Education serves as a consultant. Programs involving the introduction or presentation of information on career development in the field of botany, horticulture, landscape architecture, and natural resources were given.

A series of four programs was presented to students in the District of Columbia Public Schools, School Without Walls Program for problem learners. These students have difficulty learning in a formal classroom situation.

On Saturday, March 22, the National Arboretum in cooperation with the American Association of Botanical Gardens and Arboreta, celebrated "Veg-Day '75" with a program of lectures, demonstrations, and exhibits on vegetable gardening, canning and freezing, container gardening, and vegetable sculpture. Displays on culinary herbs, the Washington Youth Gardens, book and seed catalogs, and an exhibit of early USDA fruit and vegetable paintings were all part of the program. "Veg-Day" proved to be one of the most heavily attended programs held at the Arboretum with well over a thousand persons attending throughout the afternoon.

Meetings and Special Events. Regularly scheduled horticultural and botanical organizations meeting in the Arboretum auditorium included:
Monthly - The Washington Botanical Society, National Capital Orchid Society, Indoor Light Gardening Society, the Washington Bonsai Club; Bi-Monthly - The Camellia Society of the Potomac Valley, The Potomac Valley

Chapter of the American Rhododendron Society; Quarterly - National Capital Daffodil Society, Washington Daylily Society; The Potomac Lily Society. The National Capital Area Federation of Garden Clubs, Inc., hold bi-monthly meetings at the Arboretum as well as various committee meetings throughout the year. A flower show school and a landscape critics council are also held.

Flower Shows. The following plant societies held flower shows in the auditorium of the Arboretum's Administration Building: Potomac Bonsai Society, National Capital Orchid Society, The National Capital Daylily Club, Potomac Lily Society, D.C. Adult Education-Standard Flower Show, Potomac Valley Rhododendron Society, Potomac Valley Camellia Society (both spring and fall shows), and the National Capital Daffodil Society. These flower shows play an important role in the Arboretum's educational program, and attendance has become overwhelming.

Staff Tours. In addition to the tours handled by the Volunteer Guide Service, 51 tours were conducted by members of the Arboretum staff.

Special Tours, Horticultural Demonstrations, Nature Walks. This past year the National Arboretum has expanded its initial Weekend Spring Events to a year-round program of both weekend and weekday events. In order to keep the public informed of events, the Arboretum's Education Office issues a quarterly events notice listing nature walks, tours, flower shows, special exhibits, horticultural demonstrations, and lectures to be held at the Arboretum. This events notice is mailed to over 2,000 persons who have requested such information. Forty-two scheduled programs or events were listed in the quarterly notice this past year. It is sent on a regular basis to the Washington Convention and Visitors Bureau, local newspapers, and radio and television stations for publicity purposes. Events for 1974-75 have included: Tree Identification Walks, Tours of the Gotelli Collection of Dwarf Conifers, Daylily Walks, Fern Walks, Tours of the Arboretum's Aquatic Plantings, A Fern Valley Open House, Azalea Walks, Daffodil Walks, Camellia Walks, Wildflower and Native Plant Walks, Bonsai Demonstrations, Demonstrations on Growing Orchids, Woody Plant Identification Walks, Holly Walks, Flowering Magnolia Walks; Lectures on Bulbs and Their Culture, Camellias and Related Plants from the Far East, Poisonous Plants, Edible Wild Plants, Begonias Under Lights, Flora of Shenandoah National Park, Gloxinias and Their Relatives, and New Miniature Gloxinias and Gesneriads.

Multi-Media Slide Show. In cooperation with the USDA Office of Communication, close to a thousand color slides have been taken this past year at the Arboretum. Many of these slides will be selected for a multi-media slide show which will be assembled in time for the expected bicentennial crowds next spring. Many of these photographs will also be available for Arboretum publications such as the National Arboretum Poster Series which should also be available next spring.

Arboretum Note Cards. In cooperation with the National Arboretum, the National Capital Area Federation of Garden Clubs, Inc., has produced a new set of note cards featuring eight different color scenes of the

Arboretum. These note cards are sold by Federation volunteers in the Arboretum's Information and Activity Center.

National Arboretum Horticulture Series. The National Arboretum in cooperation with the USDA Graduate School has established a series of short courses in horticulture and related fields, to be known as the "National Arboretum Horticulture Series." The classes are taught in a two-to-four-session format, making use of the facilities at the Arboretum.

Instructors include Arboretum staff members as well as specialists from local chapters of various plant societies and members of the local extension service. Classes held to date have included the following, some of which have been repeated more than once due to their popularity: Basic Methods of Plant Propagation, Indoor Light Gardening, Plants in the Home, Introduction to Bonsai, Introduction to Indoor Bonsai, Herbs, Insects and Plant Diseases, General Ornamental Plant Culture and Care, Growing Roses, and Vegetable Gardening.

Several additional classes covering a variety of new topics are planned for the autumn quarter. The Arboretum's Curator of Education serves in a coordinating capacity for the National Arboretum Horticulture Series. He assists in the program in arranging for instructors, facilities, plan content, and promotion of the program.

B. Library

The library is another "growing" entity at the National Arboretum. The book collection is the most obvious manifestation of this growth, as shelves become more and more tightly packed. Other small increments of progress can be noted, too.

Cooperative Agreement. The National Agricultural Library (NAL) continues its active support, in accordance with the Memorandum of Agreement which was adopted in 1973. Financial assistance comes in the form of the librarian's salary, plus a book budget of \$1,000 and periodical binding services. Technical help includes general back-up for reference services, loan of books and serials not available at the Arboretum, cataloging of the books purchased under the \$1,000 allowance, and access to computerized literature searches. These searches are done on request through NAL's cataloging and indexing records back to 1970, accessed via cathode ray tube (CRT) terminals in both the Beltsville Library and the South Building Branch library.

Another automated service affecting the Arboretum library is the on-line shared cataloging service developed by the Ohio College Library Center (OCLC) whereby member libraries enter cataloging information on their newly received books, or use information they find has been entered by another member library. Much duplication of effort is thus avoided. NAL is a supporting member of this cooperative venture, providing both funding and cataloging contributions. In return, NAL is able to offer some of its branch and field libraries, including ours, the opportunity to participate at no cost to us. This will mean that cataloging of all the books we purchase through NAL can be achieved very quickly and efficiently, and catalog card sets dispatched to us promptly. Although NAL



presently performs these cataloging services for us, its backlog of work has been so heavy that long delays have resulted. It is likely that, with these speedier automated procedures, we shall be able to have our gift books processed as well--a great boon, as cataloging is a time-consuming and sometimes difficult task.

A microfiche reader has arrived in the library, courtesy of NAL. We are assigned this machine to allow access to NAL's "List of Serials Currently Received", which is now produced on Computer Output Microfiche (COM) in the interest of saving paper, money and time. What used to be listed in a stack of computer output paper twenty inches high, now occupies about 100 small film sheets. Similarly, a normal book when printed on microfiche might cover only 5 to 10 sheets in a small packet, an ideal device for conserving shelf space. The availability of this reader opens up to us the wide world of micropublications, including such marvels as the reproduction of the Linnaeus Herbarium, and runs of out-of-print journals--research tools which are available few other places in this country.

Collection Growth - Purchases. One of the Library Committee's more interesting tasks is book selection. Sorting through stacks of references, ads, recommendations and reviews, they pick the books best suited to the needs of the Arboretum staff, based on the criteria of appropriateness of subject matter, authoritativeness of treatment, and the likelihood of repeated use. Always in mind is the need to balance the interests of the horticulturists, taxonomists, geneticists, botanists and gardeners who will be using the material. For example, "Chemotaxonomy of Flowering Plants" by Gibbs is balanced by Wyman's "Dwarf Shrubs"; Kaye's "Modern Water Gardening" by Hitchcock and Cronquist's "Flora of the Pacific Northwest" and Street's "The Diagnosis of Plant Diseases." A "desiderata" box is maintained in the library, into which acquisition suggestions from the staff are put, and these are the first items considered at each selection meeting. The two relentless limitations always in the background of these sessions are the budget and the shrinking shelf space in the library. Any item which would tax either too severely, or does not meet the other criteria, is passed over, with the happy assurance that it can be borrowed from NAL if desired.

This year, 93 books have been selected for acquisition, of which 79 have been purchased and cataloged by NAL, 14 others having been ordered but not yet received.

Collection Growth - Gifts. Since last May our friends have donated 82 volumes. Included in this count are items received through exchange with other arboretums and botanical gardens, as well as USDA publications received free. Examples of these two categories are "Biology of Woody Plants: Proceedings of an International Symposium" sent to us by Arboretum Mlynany in Czechoslovakia, and the U.S. Forest Service's "Seeds of Woody Plants of the U.S. (Ag. Handbook No. 450)." Among the gift items are several real beauties brought back by Dr. Creech from his visits to Japan, and a collection of scarce treasures from mainland China, including



some floras and issues of scientific journals. The French Fund (Friends of the National Arboretum) again provided the opportunity to purchase a number of rare and out-of-print books.

Special Interest Collections. Bonsai is big these days, especially here; with a magnificent group of donated Japanese masterpieces parked so tantalizingly near at Glenn Dale awaiting their new display home outside our windows, interest in Bonsai literature has increased noticeably. Our array of books and periodicals to meet this interest is increasing steadily also. Thanks to the generosity of the various Bonsai societies, we have been given complete runs and continuing subscriptions for BCI's "Bonsai", ABS's "Bonsai Journal" and "Bonsai Bulletin" from the Bonsai Society of Greater New York. Some of the gorgeously illustrated volumes from Japan have been Bonsai books, one to note especially being the presentation book depicting our donated collection of plants and the ceremonies associated with its transfer. An assessment will be made of other Bonsai books available for purchase, and suitable ones selected by the Library Committee this next year.

This coming year we can also anticipate increased attention to herbs, as the projected Herb Garden becomes a reality. We already own quite a number of books on this subject, ranging from the antique herbals to modern how-to-grow books. However, there are some gaps, and it is our plan to consult with members of the Herb Society about appropriate selections.

As the budget permits, it is likely that FY 76 will see the beginnings of our microfiche collection. We hope that the eagerness of our readers to see the material available in this medium will overcome their customary antipathy to reading from a screen rather than a page.

Periodicals. Subscriptions to almost 100 periodicals, paid for out of the National Arboretum budget, bring in a steady flow of the latest horticultural and botanical information. Besides these, there are at least as many courtesy subscriptions. From time to time, the professional staff is asked to review these journals to assure that those received are really useful and required; it is likely that another such poll will be taken soon, in the interest of economy. As can be imagined, subscription rates have been climbing steadily.

Services. What have now become the library's standard services to its users have continued this year, including periodic announcements of book accessions, the Contents of Current Periodicals weekly current awareness notice, and reference assistance when needed. About 150 substantive reference questions, both from staff members and the public, were answered, in addition to the innumerable daily queries of "where is ...?" and "do we have...?" or "how do I find...?".

A series of library orientation tours was conducted to introduce the office, laboratory and grounds people to the materials available to them, and to acquaint them with techniques for using the catalog and other finding devices.

Liaison with NAL was provided by the librarian for expediting book loans, locating obscure items, and other reader services. A certain amount of negotiation and follow-up is also required in connection with the purchasing and cataloging services NAL provides. It is also necessary for the librarian to maintain an active awareness of NAL's vast collections, various services and procedures, in order to better serve the Arboretum clientele.

Committee. The National Arboretum Library Committee has concentrated mainly on book selection this past year. The members, Drs. Creech, Dudley and Santamour, Mr. Neumann and Mr. Eisenbeiss, have also responded generously with information and advice whenever asked, and this has been often. The FY 76 Library Committee has just begun its term, with Mr. Neumann as Chairman.

ARBORETUM RESEARCH

A. Nomenclature and Taxonomy of Cultivated Plants

Cultivated Trees and Shrubs of Southeastern United States. The aims and objectives of this project, under the leadership of Dr. Meyer, have been clearly stated in previous Advisory Council reports. The project covers a vast 13-state area, and partly because of limited travel funds, a number of areas still have not been visited. The first objective will be a check-list of plants, based solely upon documented material collected in arboretums, botanical gardens, nurseries, parks, campuses, experiment stations, and private gardens of the area.

During the year, seven field trips, of up to a week's duration, were taken to sites in Maryland, Virginia, and North Carolina, and an equal number to sites in the local Washington, D.C. area, all of which netted 754 collections for naming and addition to the plant inventory. Mr. Mazzeo has assisted in all of these field trips.

Two trips to Annapolis, Maryland, covered the Naval Academy and St. John's College. At the Academy, specimens collected, included a southern buckeye (Aesculus octandra), 70 ft. tall, and Betula pendula 'Dalecarlica', 70 ft. tall. Some of the trees collected on the small St. John's College campus are remarkable for size, including a thornless osage-orange (Maclura pomifera), 70 ft. tall, an ancient tulip-tree (Liriodendron tulipifera), 125 ft. tall and 8 ft. in diameter, and several trees-of-heaven (Ailanthus altissima), 100 ft. tall.

Two trips to the Richmond, Virginia, area were highly profitable, particularly Maymont Park, which contains many old specimen trees, planted about the turn of the present century. A few of the notable specimens collected, included a large river birch (Betula nigra), 60 ft. tall; Cephalotaxus harringtonia 'Fastigiata', with a 25 ft. branch spread; silver-fir (Abies concolor), 50 ft. tall, a tree rare in southern gardens; Chinese pistach (Pistacia chinensis), 60 ft. tall; Parrotia persica, 55 ft. tall; incense-cedar (Calocedrus decurrens), 70 ft.; Ternstroemia gymnanthera, 20 ft. tall; Osmanthus x fortunei, 20 ft. tall; cucumber magnolia (Magnolia acuminata), 70 ft. tall; and water oak (Quercus nigra), 60 ft. tall. As



a street tree, the winged-elm (Ulmus alata) is one of the commonest trees in Richmond, where specimens 60-70 ft. tall are not uncommon. The largest Ginkgo biloba we have seen anywhere in the southeast, a specimen 4 ft. in diameter and 100 ft. tall, is located on a private estate west of Richmond.

A drive down the Blue Ridge Parkway to Asheville, North Carolina, in August 1974, was of value for recording some of the native woody plants of the upper piedmont and mountain areas planted along the Parkway. Two fairly common native trees in Boone, North Carolina, are the Carolina hemlock (Tsuga caroliniana) and Fraser's fir (Abies fraseri), both planted on the campus of the Appalachian State University and in various places in the town. On the lawn of the University president, a fine specimen of Sorbus americana was covered with orange fruit, although one rarely sees this plant in cultivation.

The Biltmore House and Gardens, at Asheville, North Carolina, contains a rich assortment of woody plants, many planted at the turn of the present century by Chauncy Beadle, who planted an outstanding collection of native American azaleas at Biltmore. Two or three years ago, we made a special trip to Biltmore in May to collect the azaleas during the height of bloom. Also at Biltmore it is possible to see specimens of many rare native plants, including Elliottia racemosa, 20 ft. tall, Magnolia ashei, a distinct species closely related to M. macrophylla, and the fever-tree (Pinckneya pubens), 15 ft. tall. Among the conifers, are fruiting specimens of the Florida torreyia (Torreya taxifolia), 25 ft. tall, and mature specimens of the Carolina hemlock (Tsuga caroliniana), 50-60 ft. tall.

A week's collecting at Colonial Williamsburg was highly profitable, since the emphasis there has been on plants of the Colonial period, and native American plants rarely seen in gardens. It was interesting to note the variability in the flowers of the red-buckeye (Aesculus pavia), which is extensively planted at Williamsburg, along with other American plants rarely seen in gardens, such as leather-wood (Dirca palustris), Illicium floridanum, Croton alabamensis, Neviusia alabamensis, Mahonia trifoliata, and Alnus maritima. The trip to Williamsburg netted a number of plants previously uncollected in other parts of the southeast.

The Gulf Stream Nursery, Accomac County, on the eastern shore of Virginia, is noted for a wide assortment of unusual plants not very frequent in gardens, such as the hybrid trumpet vine, Campsis x 'Madame Galen', Stewartia serrata, S. rostrata, Magnolia x watsonii, and Poliothyrsis sinensis. A 15 ft. specimen of the windmill palm (Trachycarpus fortunei), at the nursery, shows the possibility of growing this palm in the coastal areas of Virginia and even farther north to Maryland. The mild maritime climate of Accomac County is nearing the northern limit for some other plants, such as Pittosporum tobira and the Grecian laurel (Laurus nobilis), which are hardy in protected gardens. We also discovered a large specimen of California redwood (Sequoia sempervirens), nearly 100 feet tall, which is the largest specimen we have seen on the east coast. We also saw a weeping beech (Fagus sylvatica 'Pendula'), 40 ft. tall, and a fine group of Cedrus atlantica, C. deodara, and C. libani, all growing close together.

We are attempting a full documentation of cultivated trees and shrubs in the metropolitan Washington, D.C. area, including a full documentation of the collections at Mount Vernon, where some of the trees date from 1785, when George Washington was a resident.

Koelreuteria. This research was reported in full by Dr. Meyer in the last Annual Report. The project is now finished, and the manuscript was submitted for publication in June.

Prunus (flowering cherries). Mr. Jefferson and Dr. Alan Fusoni, National Agricultural Library, are collaborating on a National Arboretum Bicentennial publication on the Potomac Park Japanese cherry trees. Over the past 3 years, Mr. Jefferson has conducted all of the basic research bringing together a vast amount of unpublished material related to one of Washington's best known attractions. A target date of January 31, 1976, has been tentatively set for completion of the manuscript. The work will be divided into two sections comprising the following topics: (1) Origin, development, and significance of the Japanese cherry trees in Potomac Park. (2) The enduring interest of these trees. (3) Biographical profiles of individuals involved in the Potomac Park cherry tree introduction and care. (4) Information on the diseases that caused the first shipment to be destroyed. (5) Answers to questions most often asked about the trees. (6) Information on other major Japanese cherry collections found in the United States. (7) How to care for Japanese cherry trees.

Ilex (holly). Part II of the International Check List of Cultivated Ilex by T. R. Dudley and G. K. Eisenbeiss will be devoted exclusively to nearly 300 cultivars and botanical taxa of I. crenata. The Check List will establish the epithet priorities, correct spellings, and legitimize the nomenclature of the forms, varieties, and cultivars of this important ornamental shrub.

Viburnum and Dwarf Conifers. Research on Viburnum taxonomy and identification of entities in the conifer collection as reported by Dr. Dudley in the 1973-74 Annual Report continues.

Other Botanical Research. Mr. Mazzeo has initiated a project to prepare the first Check List of vascular plants (trees, shrubs, vines, and herbaceous plants, including ferns and fern allies) for purposes of identification and labeling of the plants in Fern Valley. This will fulfill a need for updating one of the most popular areas of the Arboretum visited by the public. The completed list will be published and made available to the public. Mr. Mazzeo continues to assist in the planning and participation of field work for the southeastern woody plants project. As an official Park collaborator in the Shenandoah National Park, he also keeps an interest in the flora of that area, maintaining a Check List and plant distribution record for the flora of the Park. So far, this has led to two major publications, (1) trees and (2) ferns, as well as several smaller publications.

Currently, Mr. Mazzeo is Chairman of the Flora Committee and co-ordinator of the Flora of Virginia project of the Virginia Academy of Sciences. He is working on a treatment of the birch family (Betulaceae) of Virginia, and is hopeful that Betula uber, collected only once in 1943, may again be found. He is also up-dating an earlier treatment of the native conifers of Virginia.

Herbarium. An herbarium is like a savings account, in that it is there when you need it. And, like savings, an herbarium is of most value when you have a lot of it. Year to year growth of the Arboretum herbarium continues to add, exponentially, to its value and strength as a tool for research and plant identification. In the long range view, the aim is to continue building a large world-wide herbarium, concentrating on cultivated plants and their wild progenitors. Without the collection, we could do very little, but with it, the potential is almost unlimited. Exchange relationships are maintained with 80 institutions over the world on an exchange, purchase, and gift basis. Recently, we added two new contacts, one Mr. W. M. Bush of Honolulu, who sends many beautifully prepared specimens of cultivated plants and weeds from the streets and gardens of the Hawaiian islands. A year ago we initiated an exchange of herbarium material with the herbarium at Peking, People's Republic of China, when Dr. Creech hand-carried a small bundle of plants to China and brought back in exchange a bundle of plants offered by the herbarium in Peking.

Mr. Mazzeo continues to do most of the general curating in the herbarium, assisted by one temporary student employee. Dr. Dudley, likewise, curates certain sections dealing with his own research interests such as Ilex and Viburnum, as well as filing away all "type" materials.

Interpretative tours for college students and other interested groups of both the herbarium and the living collections in the Arboretum are a regular part of herbarium activities. Mr. Mazzeo has been particularly active in these programs.

The most serious loss during the year was Mrs. Susanne Elsasser, an unsalaried research assistant, who moved to Baltimore last December after working in the herbarium since early 1968. Her language ability, tenacity, and interest in the Martindale herbarium was a major contribution. At one point, she collaborated with Dr. Meyer in a publication on the Martindale collection.

Field Trips. During the year, about 6000 specimens, representing over 750 separate collections, were collected on behalf of the southeastern United States cultivated trees and shrubs project. This does not take into account many collections made by various staff members for purposes of accurate identification and documentation of materials growing on the grounds of the National Arboretum, particularly material in the Gotelli conifer and holly collections. Dr. Dudley contributed miscellaneous wild and cultivated specimens from Florida, Puerto Rico, Guadeloupe, St. Lucia, and Cape Cod.

Staten Island, Argentina. This large and important collection has

now been fully processed under Dr. Dudley's direction. This material, plus an extensive collection of Tierra del Fuego plants already in the herbarium, gives us one of the largest research collections in the country of plants from the southern tip of South America. Dr. Dudley is now finishing a paper incorporating his field data and identifications of all the plants collected on the 1971 Staten Island expedition. This will be published together with two other papers by members of the expedition.

Identification of Plant Materials in Excavations at Pompeii and Herculaneum, Italy. Carbonized materials collected during the summer of 1974 by Dr. Wilhelmina F. Jashemski have been identified by Dr. Meyer from two sites at Pompeii, dating from the eruption of 79 A.D. These include material of fig (Ficus carica), pine (Pinus pinea), sour cherry (Prunus cerasus), and almond (Prunus amygdalus). The bottle gourd (Lagenaria siceraria) and onion (Allium cepa) were the most significant additions to the plant list, both found on wall paintings at Herculaneum. The identification of plants on wall paintings, sculpture, mosaics, and carbonized material will be incorporated in a book by Dr. Jashemski on the ancient gardens of Pompeii, Herculaneum, and Stabiae.

Statistical Report

Herbarium Material Received

4/1/73-3/31/74 3/31/74-6/30/75

Number of accessions of herbarium specimens received from other institutions and individuals.....	71	66
Number of specimens received		
as exchange.....	2,197	2,174
as purchase.....	416	777
as gift.....	8,587	4,083
Total number of specimens received.....	11,200	7,034

Herbarium Material Sent

Number of specimens sent		
as exchange.....	4,373	8,623
as gift.....	413	80
Total number of specimens sent to other institutions.....	4,786	8,703

Materials have been sent to or received from more than 100 institutions in the following countries: Argentina, Australia, Canada, Chile, Greece, El Salvador, Fiji, Great Britain (England and Scotland), Japan, Mexico, Netherlands, New Zealand, People's Republic of China, Philippines, Rhodesia, Romania, South Africa, Sweden, USA, and USSR.

Herbarium Material Borrowed (Loans)

Number of loans sent to other institutions.....	30	45
Number of specimens loaned.....	4,173	6,247
Number of loans from other institutions.....	16	29
Number of specimens borrowed from other institutions.....	1,229	6,692

Content of Herbarium

Number of specimens mounted and added to permanent collection:

Regular material.....	13,521	6,604
Martindale collection.....	0	4,521
Total.....	13,521	11,125
Number of herbarium specimens in permanent collection.....	377,900	389,025
Number of specimens collected by herbarium staff.....	5,900	c. 6,000
Number of specimens added to the type collection.....	217	384
Total number of specimens housed in the type collection, including clonotypes.....	1,106	1,482
Miscellaneous identifications of weeds and other material sent in via mail (all sources).....	368	384

Extra-mural Research

Propagation, Growth, and Development of Ornamental Clones of Native Ilex: Diagnostic Characters of Deciduous Taxa.

Dr. T. R. Dudley, research botanist at the National Arboretum, serves as USDA representative on a research contract with the West Virginia University to collect, evaluate, and distribute variants of hollies, particularly the deciduous species, native of West Virginia and adjacent states. The field work for this project is conducted by Dr. O. M. Neal, Professor of Horticulture. Evaluation and testing of elite clones, hybrids, and deciduous taxa continues; at least 10 were propagated and used as trial materials for orcharding, terraria, and potted plants for the Christmas market. Propagation, hybridization and pollen compatibility programs were expanded to make superior ornamental selections more readily available for landscape and special marketing procedures. Techniques are being developed to propagate desirable, but difficult, species such as Ilex pedunculosa and I. chinensis. The large collection of deciduous species is being used for propagation, diagnostic and comparative taxonomic, morphological studies. For the first time, a feasible technique was developed to propagate the rare, endangered, deciduous I. (Nemopanthus) collinus using embryo culture on sterile media, transferral to a soil medium and acclimatization.

B. Cytogenetics, Breeding, and Evaluation of Shade Trees

Acer. Verticillium wilt disease is one of the major causes of decline and death of maples on our city streets. Red, silver, Norway, and sugar maples, as well as a number of less-important species are susceptible to this soil-borne pathogen. No selections for resistance to this disease have been made and the susceptibility of the many maple cultivars currently in the nursery trade is unknown. In 1974, with the kind permission of the U.S. Forest Service, we were able to inoculate 470 mature maples of known pedigree. The trees had resulted from controlled crossing in 1940 and 1941 and are mostly intraspecific red and silver maples and interspecific hybrids between these species. Fortunately, most of the parent trees were vegetatively propagated and were included in the test planting. Thus, we should be able to obtain good data on heritability of resistance. It is also possible that some preliminary selections of disease-resistant trees of good ornamental quality can be made. Another possibility is the selection of resistant parents to be used in a seed orchard for the sexual production of disease-resistant rootstock material.

Gleditsia. In 1974, we tested a number of exotic honeylocust species for resistance to attack by mimosa webworm. Of the seven species that were adequately tested, none was found to be resistant. Four more species (slower-growing) will be available for test in 1975. It appears that there is only a remote possibility that interspecific hybridization will be a major factor in the development of superior webworm-resistant trees. Thus, the large-scale screening of populations of G. triacanthos seems to offer the best chance of making resistant selections.

One other interesting note. We had been using, in our biochemical, hybridization, and screening tests, a tree labeled "G. sinensis" at Glenn Dale. It was obviously not G. sinensis, and we figured that biochemical comparisons with our new accessions would give us an identification. They did not! The Glenn Dale tree was different from all the species we were able to collect. Recently, with the help of a new Chinese Flora, we were able to identify the Glenn Dale tree as G. melanacantha Tang & Wang -- new to cultivation in this country.

Ilex. Ilex perado was introduced into England from the Canary Islands in 1840. Natural crossing with I. aquifolium in English gardens gave rise to the hybrid I. x altaclarensis, and the best of the "English" type hollies are of this parentage. Over the years, we have obtained I. perado from various sources, from native and cultivated plants. Our recent evaluation has shown that several plants of this species have shown unexpected hardiness in this area -- much better than most I. aquifolium. Furthermore, several of the trees are developing a good pyramidal tree habit. The best male and female trees were propagated in 1974, and we will be distributing these clones to cooperators for evaluation in 1976. Although we expect that the clones will be adaptable to milder climates like California, we are also interested in the potential hardiness range of these plants.

In 1975, we began to look critically at the leaf miner problem in I. opaca. Limited analyses on several female cultivars showed that there were highly significant differences in the number of feeding punctures (Ex. an average of 14 per leaf for 'Old Heavy Berry' as opposed to 324 punctures per leaf in 'Lowell'). 'Christmas Carol' averaged 96 feeding punctures per leaf and almost 1 mine per leaf on the new growth. Feeding punctures constitute a significant part of the "visible damage" caused by the miner. Controlled pollinations were made in 1975 and will be continued in ensuing years to determine the potential of breeding for leaf miner resistance.

One new hybrid holly was distributed for evaluation in 1975, and a variegated sport of 'Foster #2' will be distributed in 1976.

Magnolia. Magnolia acuminata has been little used in our hybridization work, largely because of many unsuccessful attempts over the years. This species has good hardiness, a good tree habit, and the potential for producing, in hybrid combinations, new flower colors. Over the past two years, we have made a determined effort to cross acuminata with a number of desirable parental species and cultivars. Through cytological and biochemical analyses, we have confirmed the hybridity of combinations with the diploid 'Wada's Memory' and the hexaploids denudata, sprengeri 'Diva', and (x veitchii x denudata) as male parents. At least seven years will be required for these trees to flower.

Pinus. In collaboration with Dr. D. F. Zinkel, of the U.S. Forest Products Laboratory in Madison, Wisconsin, we have been making some progress on the nature of weevil resistance in eastern white pine. From resin supplied by the Arboretum, Dr. Zinkel identified a new resin acid--strobic acid. We have found that trees producing resin that is lacking in strobic acid do not crystallize in a standard larva-resin test, and the lack of resin crystallization may be related to insect resistance. The production of strobic acid by the tree does appear to be a dominant trait, however, and we have found only two trees lacking this resin component. Further cooperation with other agencies in the Northeast, where the weevil is native, are contemplated in the near future.

Platanus. The long-awaited natural infection of our test plantings with sycamore anthracnose disease finally occurred in 1974. The results of our first evaluation were most encouraging. As expected, P. orientalis was the most resistant species and P. occidentalis was generally susceptible. However, the high heritability of resistance in our first-generation "London Plane" hybrids indicates that we will have a large number of disease-resistant trees from which to select desirable types. Hybrids between P. occidentalis and the western American species (P. racemosa and P. wrightii) were extremely susceptible to anthracnose. Although few hybrids of P. orientalis and the Western species were present in the infected block, it appears that some of these hybrids may also be highly resistant to anthracnose.

Four disease-resistant selections are currently being propagated for further study.

Interest in Platanus as "silage sycamore" for pulp production has increased in recent years. However, a number of problems have occurred in plantations in the Mississippi delta country. A disease complex, which includes anthracnose, is threatening to severely limit this method of sycamore culture. Therefore, we were anxious to cooperate with the U.S. Forest Service in solving this problem. In 1975, pollen was sent to us from several select trees of P. occidentalis in Mississippi and Louisiana. We made controlled pollinations on two of our best P. orientalis at the Arboretum. In the fall of 1975, we will harvest the fruit and ship them to Mississippi. Judging from the fruit that are maturing, Forest Service researchers should be able to grow thousands of hybrid seedlings of the various progenies, and subsequently select the most vigorous and disease-resistant individuals for pulpwood purposes.

Rhododendron. Fewer than 50% of the 550 F₁ hybrids between yellow-flowered rhododendrons and evergreen azaleas have flowered -- and, as yet, no yellow-flowered evergreen hybrids have been noted. Hybridization in 1975 has emphasized F₂, backcross, and more complex second generation crosses.

Ulmus. Rooted cuttings of 5 Dutch elm disease-resistant elm hybrids were distributed in 1975 to cooperating scientists and nurserymen for further evaluation.

Artificial inoculations of hybrid elms derived from 1972 crosses were made in May-June 1975, with a mixture of 5 highly virulent isolates. Two of these progenies were from tri-species crosses that had been repeated to allow for more extensive testing. As before, the parvifolia x (pumila x rubra) and parvifolia x (americana x pumila) hybrids were highly susceptible. Two resistant trees of parvifolia x carpinifolia were selected for future observations and testing.

Re-inoculation of resistant selections from the 1970 crosses showed that the trees were highly resistant to the new pathogen isolates.

In addition, a control-pollinated disease-resistant seedling of parvifolia x parvifolia was selected because of its vase-shaped form and reddish autumn leaf color. This clone is being propagated for distribution under our evaluation program.

Sterile Triploids. This year we initiated a program which may eventually lead to the production of sterile, non-fruitle triploid cultivars in certain genera where fruit or seed production is objectionable. Seedlings of various species were treated with colchicine to induce tetraploidy. After the tetraploids have produced flowers, the cross of diploid x tetraploid should give us a population of sterile triploids to select from. This plan is not as simple or simplistic as it is written above. One major problem is the recognition of polyploid plants or plant sectors and the maintenance of the polyploid until sexual maturity. Another drawback is the long time necessary for most trees to begin blooming, and the 2-generation (10-20 years) wait necessary for final selection.

We have achieved polyploidy in Catalpa, Cladrastis, Koelreuteria, Oxydendrum, Paulownia, and Sophora. And we have been pleasantly surprised by the fact that many of our 1-year-old Paulownia have set flower buds that will bloom next year. Not all genera will be so cooperative, however.

Extra-Mural Research

West Virginia Research on Elm Fungus

The research project on "An Evaluation of Resistant Elm Clones to New Strains of the Dutch Elm Disease Fungus" at West Virginia University was to have terminated on June 30, 1975, under the terms of the original cooperative agreement. However, the research findings of the group headed by Dr. William L. MacDonald (Principal Investigator) were of such potential importance that ARS granted sufficient additional funds to help carry the program for another year. Defined culture media have been developed for both synnemata and perithecia production. No relation between enzyme production and pathogenicity could be determined. Nor was there any simple correlation between growth rate and pathogenicity, as British workers had reported. However, when multiple criteria such as synnemata production, radial growth, aerial mycelium, and pigment production were used to judge pathogenicity, the correlations were quite significant. Dr. Santamour is the USDA representative on this project.

C. Cytogenetics, Breeding, and Evaluation of Ornamental Shrubs

Within the Shrub Breeding Project there have been several personnel changes during the year. As a consequence, it became necessary to realign or curtail certain aspects of the research during the spring months. Mr. L. I. Benedict filled the Agricultural Research Technician position that had been vacant for several months. Mr. Edwin Summers, a student at Salisbury State College, joined the research staff as a Biological Aid on a WAE appointment. With the excellent assistance and cooperation of the staff, major shrub breeding achievements have been made.

Cercis. The 19 dark, clear pink selections obtained from crosses of pink-flowered, white-flowered, and F₁ C. canadensis x C. chinensis were space planted for further evaluation.

Cotoneaster. From the 6,677 seedlings representing select clones and species that were fire blight inoculated under controlled conditions, 560 resistant plants were recovered. These plants have been grown in gallon containers prior to field planting next season.

Hamamelis. Research has been initiated with the objective to produce superior clones with abundant, early flowering, large flowers, improved color, little or no leaf retention, and intergeneric hybrids. The first crosses were made, but due to extremely high winds and storms in early April 1975, the greatest portion of the pollination bags were lost. In preliminary intergeneric crosses a few seed capsules have been set by crosses of Hamamelis x Corylopsis. Forty-four accessions of Hamamelis and related genera have been propagated to provide stock plants for future research.

Hibiscus. Research has been limited to production of triploid H. syriacus that would be counterparts of the cultivar 'Diana' and extend the color and growth habit range. Three plants each of 71 triploid seedling selections made in 1973 were field planted for further evaluation. Two of these, one with pink flower color and the other white with red eye spot, have been selected for stock increase and introduction. Both have abundant flowers of good size and color; heavy, dark green leaves that are highly pollution tolerant; and produce few or no seed. In 1974, 23 crosses were made between tetraploids and select diploids with pink-colored flowers in an attempt to intensify the pink coloration. From these crosses, 542 seedlings have been produced which have been grown in gallon containers prior to field planting next season. The block of clonal parental stocks has been discarded, and the land cleared for additional nursery planting. Six scions each of 19 Hibiscus selections were sent to the Botanic Garden at Adelaide, South Australia.

Lagerstroemia. From the 50,799 F₁, F₂, and backcross L. indica x L. fauriei seedlings grown in 1972-73, 17,772 were field planted and 9,668 grown in gallon containers. Those field planted were severely damaged during the winter, and many were killed to near the groundline. However, most have made good growth and should flower late this season. Of the 333 crosses made in 1974, 279 produced seed and a seedling population of 16,358. This was the second season for some and the first season for many more of the L. indica x L. fauriei hybrids to exfoliate bark. Those exfoliating the second season were far more spectacular as the entire trunk peeled the bark uniformly rather than the usual patch pattern for L. indica. In the hybrid progeny, trunk colors from pale cream and light brown to dark cinnamon brown that are as ornamental as the spectacular flowers have been selected. Two of the F₁ hybrids, one lavender with medium brown trunk and the other white with dark cinnamon trunk, have been selected to stock increase and introduction. Six scions each of 48 selections were sent to the Botanic Garden, Adelaide, South Australia, for evaluation.

Malus. From the population of 39,638 seedlings produced from seed of 169 accessions, representing 28 species and 54 cultivars, 888 fire blight resistant plants have been isolated after controlled inoculation. These plants, which have been space planted in the nursery, will be evaluated for ornamental characteristics, and for possible disease resistant parental stocks for future hybridization. Only 182 fire blight resistant seedlings were recovered from the 1,008 seedlings produced from the 1973 crosses.

Pyracantha. In 1974, 80 seedling selections were made from the advanced generation seedling populations which flowered and fruited extremely heavily. A dense, low-growing, dark evergreen foliage, luminous orange-red fruit that ripen late and persist throughout the winter, and fire blight and scab resistant hybrid of P. crenulata, P. coccinea 'Lalandei' and P. angustifolia has been selected for stock increase and introduction. The 1970-71 seedlings flowered heavily for the first time and many have set abundant fruit that will enable making the first selections. From the 19,750 intergeneric seedlings grown in 1973, only 550

fire blight resistant plants were recovered that have been grown in gallon containers prior to field planting next season. From 122 seed lots sown in 1974, a total of 14,178 seedlings were grown and fire blight inoculated under controlled conditions to produce 667 resistant plants for further evaluation. Three hundred seedling selections, representing 12 cultivars and 3 species accessions, were propagated to produce 25 plants of each for a final critical fire blight screen inoculation. These, plus an additional 283 selections propagated in 1973, were inoculated and evaluated for resistance. Only those selections which are resistant are maintained for further evaluation or distribution through the cooperative program.

Syringa. The research collection has been increased by 181 accessions. The major Syringa collections at Highland Park, Rochester, New York, and Swarthmore College, Swarthmore, Pennsylvania, were visited in June 1975, to record notes and to obtain propagation material. The seedlings produced in 1973 have been planted in the lath house for a season prior to field planting. Stock plants of 252 have been grown in containers for future pollination. Since it is the early-flowering S. oblata cultivars that are most satisfactory in this region and the ones with potential for more southern culture, a trial evaluation planting of all available clones has been initiated and many of the plants already are propagated. The main direction of the Syringa research is the hybridization of the best of the S. oblata clones with the heat tolerant species in order to produce mildew-resistant, heat tolerant cultivars adaptable to southern conditions.

Viburnum. The Viburnum research has been curtailed to evaluation of seedlings and limited hybridization of dwarf or compact growth habits. The collection of stock plants has been discarded, and will be removed from the nursery in order to provide additional planting area. An additional 10 selections have been made from seedling populations. A compact, dense flowering, semi-evergreen F₂ seedling with V. carlesi, V. x carlcephalum, and V. utile in the parentage has been selected for stock increase. An F₂ V. plicatum var. tomentosum with the sterile marginal flowers, a third larger than any other cultivar, was distributed to 19 wholesale propagation nursery cooperators for stock increase and to eight foreign cooperators for evaluation.

Cooperative Stock Increase and Evaluation Programs

The cooperative stock increase and evaluation programs have promoted the expedient introduction of a superior seedling selection produced by one of the research programs. At present there are 29 wholesale propagation nurseries in the cooperative stock increase program; and 90 cooperators, composed of 36 nurseries, 17 arboreta and botanic gardens, 22 universities, and 15 miscellaneous, in the evaluation program. In addition, potential introductions are sent to 14 foreign locations for evaluation and promotion.

(Tabulation of 1975 distribution, next page.)

COOPERATIVE PROGRAM 1975

	<u>No. Cooperators</u>	<u>No. Plants</u>
<u>STOCK INCREASE</u>		
Viburnum - 1 selection	19	190
<u>EVALUATION</u>		
Ilex - 7 selections	32	210
	10 (foreign)	74
Magnolia - 4 selections	15	86
	10 (foreign)	60
Ulmus - 4 selections	8	65
Viburnum - 1 selection	2	6
	8 (foreign)	24

SUMMARY

	<u>No. Cooperators</u>	<u>No. Genera</u>	<u>No. Plants</u>
<u>Stock Increase</u>	19	1	190
<u>Evaluation</u>	46*	4**	366)
Foreign	10	4**	158) 524

* Representing 8 arboreta, 27 nurseries, 7 universities, and 4 miscellaneous.

**4 genera representing 16 selections.

D. Ornamental Introduction, Evaluation and Development

Camellia

Breeding for Floral Fragrance. The incorporation of floral fragrance into camellia hybrids and seedling selections has been accomplished mainly through the use of lesser-known species such as C. lutchuensis, C. tsaii and C. fraterna, all of which have small insignificant flowers. These species were crossed with non-fragrant cultivars of C. japonica, C. reticulata, C. rusticana, and C. saluenensis. The F₁ interspecific hybrids were largely intermediate in size, of varying degrees of fragrance, and semi-sterile. One of the best F₁ hybrids, 'Fragrant Pink', was treated with colchicine, resulting in a cytochimera with tetraploid internal tissue and a diploid epidermis; sexually it functions as a fertile tetraploid. This cytochimera has proven to be stable and was named 'Fragrant Pink Improved' in 1975.

There is evidence that floral fragrance is determined by a number of genes affecting this character. Hybrids of C. sasanqua with C. oleifera (both of which have a musky odor) have a greater odor than either parent. To correct a weakness in early breeding efforts where non-fragrant cultivars were used to gain flower size, a search was made for fragrant C. japonica cultivars among gardens of the West Coast and Southeast. A total of 50 cultivars possessing some degree of fragrance have been propagated and established at Glenn Dale, Maryland, for use with 'Fragrant Pink Improved' and other promising C. lutchuensis hybrids.

During the 1974-75 season, 2,650 controlled crosses were made utilizing C. japonica cultivars possessing some fragrance with 'Fragrant Pink Improved', other promising C. lutchuensis hybrids, and C. lutchuensis itself. Seed capsule development totaled 345, and to date, with approximately 75% harvest, 636 hybrid seedlings are being grown.

Greater Cold Hardiness. A total of 2,200 seedlings grown for progeny testing of selected cold hardy clones, were moved to an unheated plastic house at Glenn Dale for their first winter evaluation. Next May these plants will be transferred to the field for more severe exposure to Glenn Dale's winters.

An unnamed selection, A-500, has been propagated for field testing. This clone is a cross between 'Frost Queen' and 'Fragrant Pink'. The most outstanding characteristic of this hybrid is the potential combination of cold hardiness from the seed parent with floral fragrance from the pollen parent. 'Frost Queen' has withstood field trials of five winters at Glenn Dale with temperatures as low as -8°F without apparent injury. The flowers of A-500 are rose pink with pale cream stamens, golden yellow anthers; semi-double, 14 petals, 4 inches across and free-flowering. Fragrance is similar to 'Fragrant Pink'.

Intergeneric Hybridization. Immuno-suppressants have been used successfully in making intergeneric crosses among cereal grains, resulting in

wheat x barley and oats x barley crosses. During the summer of 1975, the immuno-suppressant e-Amino Caproic Acid (EACA) was used in several methods of application, both prior and at the time of emasculation and pollination of Franklinia crossed with Camellia. As a check, crosses were made between these two species without the use of EACA. A total of 1,585 crosses were made. As yet, it is too early to accurately evaluate the results, but we do have capsule development in a number of the treated crosses with no idea as to whether these contain viable seed initials.

Crosses were also made between Stewartia and Camellia; 86 crosses including S. monadelphica, resulted in 4 seed capsules and 467 crosses with S. ovata resulted in 21 seed capsules. Here again, seed capsule development gives no assurance of viable seed initials present.

Anther Culture. The successful culturing of anthers has been reported for a number of plant materials, most notably herbaceous plants. However, there are a few reported successes in such woody materials as Malus and Populus. Frequently, but not always, these cultured plants are haploid. Doubling the chromosomes of haploid plants with colchicine would produce homozygous lines, which would greatly simplify the study of genetic characters in presently highly heterozygous materials. Also, there are certain polyploid species of Camellia, where it would be highly desirable to have haploids for study.

A series of experiments were conducted in 1974-75 to investigate the potential of culturing immature anthers by the use of various nutrient media under aseptic conditions. Pollen of Camellia and Franklinia were used in conjunction with 18 media preparations. None of the Camellia pollen survived after one week in culture. Franklinia pollen in 2 of the 18 media preparations remain alive after 4 weeks in culture (to the present date) and show some indications of growth. After 2 weeks, the pollen took on a greenish coloration indicating formation of chlorophyll, and after 3 weeks there was evidence of callus development. At 4 weeks, there was no further growth and some evidence of degeneration. It would appear that specific requirements for full development of plant tissues have not been satisfied, but are not impossible.

Iris kaempferi

The Japanese iris has many virtues as a showy garden flower, yet it occupies a minor role compared with the German iris. A disadvantage, which may in part affect its popularity is the short life span of the individual blossoms. Breeding and selection at Glenn Dale has resulted in the development of 5-day blossoming clones compared to two days for most flowers of this species. Preliminary selections from among these long blossoming strains are underway for flowers of good size, form, color, and substance. Culling of potted material during the spring of 1975 reduced an F₂ population from about 1,500 to 600. The remaining plants were later field planted for further evaluation.

Efforts are underway to develop polyploid forms of the best of the Iris selections by colchicine treatment of the seeds and meristematic tissues.

Lycoris

The development of cold-hardy, yellow flowered hybrids through interspecific hybridization is the main objective in working with this genus. Progress has been slow because of sterility barriers that appear to exist both within and between a number of Lycoris species. A series of several dozen hybrids have been developed, but as yet, none of these have flowered.

Malus

Evaluation of Plant Introduction materials has resulted in the discovery of an ornamental crab that shows considerable promise. The clone was found as a seedling rootstock after the grafted Malus cultivar introduction failed. The selection (B59542) is very heavy blooming, forming masses of pinkish-white blossoms in the spring, and an abundance of deep maroon fruits in the autumn which hang on the tree until early December when they soften and are eaten by birds. Grafted trees at Glenn Dale bore heavily two years from bud; heavy fruit production results in slow growth and dwarfing of the trees. The selection compares very favorably with the much-acclaimed patented variety 'Crittenden', except it has maroon instead of orange-red fruits.

Twenty-five trees were budded of B59542 in August 1974, and an additional 50 were budded during the summer of 1975. These trees, when of sufficient size, will be placed into the National Arboretum cooperative program with selected nurserymen for further evaluation.

Pyrus

Work with this genus is primarily with P. calleryana but also to a lesser extent with other minor species and hybrids. Survey and evaluation of a semi-wild seedling population of ca. 3,000 specimens resulted in 12 preliminary selections. Among these, one selection, a narrow columnar form, shows special promise for planting along narrow streets and other restricted areas.

Propagations of this selection were made during the 1974-75 season for evaluation under other climatic conditions.

Rhododendron japonicum

The objective has been to develop two true breeding lines: (1) yellow-flowered form, and (2) salmon-pink form. Inbreeding desirable selections has been carried through to the F₃ generation. From this population, now field planted at Glenn Dale, it is hoped that final selections may be possible.

E. Plant Introduction Station, Glenn Dale, Maryland

The Plant Introduction Station at Glenn Dale is now a part of the National Arboretum. The 70-acre station is staffed with 11 ARS and 3 APHIS persons. Their primary responsibilities are to receive plant materials for the USDA which are imported from all countries of the world. Plants are observed in quarantine for all types of pests including insects, fungi, bacteria, snails, and nematodes. They are tested, using several techniques, for a broad range of viroids, viruses, and mycoplasmas. Items found free of all pests are propagated and distributed to breeders throughout the United States. An average of 556 fruit, 1,971 ornamental, and 248 miscellaneous items were distributed to some 395 horticulturists, plant breeders, pathologists, biochemists, and agronomists during each of the past 5 years.

Another major activity at this Station involves detailed studies on viruses from fruit and woody ornamental plants. Viruses are extracted, purified, studied chemically and physically, and identified using host range, particle structure, and serology as the main criteria. During the past year, a virus disease of each of hibiscus, jasmine, cactus, geranium, and beans were studied in detail. These results are in press.

PUBLICATIONS

- Ackerman, W. L. 1974. Seeing camellias first hand. *Amer. Camellia Jour.* 29(1): 10-11.
- Ackerman, W. L. 1974. Breeding new hybrid races of Camellia (Book Chapter) Breeding Plants for Home and Garden. Brooklyn Botanic Garden, N.Y.
- Ackerman, W. L. 1974. The search for floral fragrance in camellias. *Amer. Camellia Yrbk.* Vol. II: 186-191.
- Ackerman, W. L. 1975. Handling Camellia seeds by aseptic culture. *Camellia Review* 36(6): 3-5.
- Ackerman, W. L. 1975. The greenhouse and its application to Camellia breeding. *Amer. Camellia Jour.* 30(3): 27-28.
- Burns, C. and T. R. Dudley. 1974. Report of the holly sprig contest. *Proc. of the 51st Meeting of the Holly Society of America, Inc.*: 10.
- Creech, J. L. 1974. Highlights of ornamental plant introduction in the United States. *The Longwood Program Seminars 1974*, Univ. of Delaware 6: 20-26.
- Creech, J. L. 1975. Windows on the world. *The Garden Club of America Bull.* 63(1): 22-25.
- Creech, J. L. 1975. Plant studies in the People's Republic of China: A trip report of the American Plant Studies Delegation. (In part.) *Nat. Acad. of Sci., Wash.*, 205 pp.
- Egolf, D. R. 1974. Pyracantha breeding at the U.S. National Arboretum. (Paper presented at ASHS meeting, Raleigh, N.C., 8/20/73.) *Annual Report for Ornamental Plant Breeders, Comm. for Ornamental Plant Breeding, ASHS*, Vol. 2: 2-5.
- Egolf, D. R. 1975. 'Erie' *Viburnum*. *HortScience* 10(4): 430-431.
- Egolf, D. R., and F. S. Santamour, Jr. 1975. Anthocyanin pigments and breeding potential in crapemyrtle (Lagerstroemia indica L.) and Rose of Sharon (Hibiscus syriacus L.). *HortScience* 10(3): 223-224.
- Eisenbeiss, G. K. 1974. Questions on holly culture. *Proceedings 51st Annual Meeting of the Holly Society of America, Inc.*: 17-20.
- Eisenbeiss, G. K. ^{+ T. R. Dudley} 1974. Ilex cultivar registration list 1958-1973. *Holly Soc. of Amer. Bull.* No. 13: 11 pp.
- Eisenbeiss, G. K., and T. R. Dudley. 1974. Report of the International Checklist Comm. *Proceedings of the 50th Meeting of the Holly Society of America, Inc.*: 11; Ibid. 51st Meeting: 7-8.

- Eisenbeiss, G. K., and T. R. Dudley. 1974. Report of the International Holly Registration Committee. Proceedings of the 50th Meeting of the Holly Society of America, Inc.: 11-12; Ibid. 51st Meeting: 8-9.
- Eisenbeiss, G. K., and T. R. Dudley. 1974. Research grants and projects of the Holly Society of America, Inc. Proceedings 50th Meeting Holly Society of America, Inc.: 12-13; Ibid. 51st Meeting: 8-9.
- Eisenbeiss, G. K., and T. R. Dudley. 1974. Report of the International Holly Registration Comm. Holly Letter, Holly Society of America, Inc. 48: 7-8; Ibid. 49: 7-8; 50: 5.
- Jefferson, R. M. 1975. Boxwood around the Lincoln Memorial. American Horticulturist Vol. 54(4): 6-10.
- Mazzeo, P. M. 1974. Fern Valley at the National Arboretum--a living museum and teaching laboratory (Abstract). Va. Acad. Sci. 25: 73.
- Mazzeo, P. M. 1974. Betula uber. What is it and where is it? Castanea 39: 273-278.
- Meyer, F. G. 1974. Cultivated species of Koelreuteria in Hortus III. (In press).
- Meyer, F. G. 1975. A revision of the genus Koelreuteria (Sapindaceae). Jour. Arnold Arb. (In press).
- Santamour, Jr., F. S. 1974. Holly fruit pigments: Taxonomic and genetic implications. Holly Letter No. 49: 3-5.
- Santamour, Jr., F. S. 1974. Resistance of new elm hybrids to Dutch elm disease. Plant Dis. Repr. 58: 727-730.
- Waterworth, H. E. 1974. Bean curly dwarf mosaic disease caused by a virus serologically related to squash mosaic virus. Proc. of Am. Phytopath. Soc. 1: 49.
- Waterworth, H. E., R. H. Lawson, and R. P. Kahn. 1974. Purification, electron microscopy, and serology of Dioscorea latent virus. The Jour. of Agr. of the Univ. of Puerto Rico 58(3): 351-357.
- Waterworth, H. E. 1975. Purification of arabis mosaic virus isolated from a jasmine plant introduction. Phytopathology 65(8): 927-928.
- Waterworth, H. E., J. M. Kaper, and R. Koenig. 1975. Purification and properties of a tymovirus from Abelia. Phytopathology 65(8): 891-896.
- Waterworth, H. E., and R. L. Monroe. 1975. Graft transmission of olive sickle leaf disorder. Plant Dis. Repr. 59: 366-367.
- Waterworth, H. E., and W. R. Povish. 1975. A virus related to cucumber mosaic virus isolated from imported Ixora plants. Phytopathology 65: 728-729.

